

**Section 1086**

**SECTION 1086  
PAVEMENT MARKERS**

**1086-1 TEMPORARY RAISED PAVEMENT MARKERS**

**(A) General**

Use raised pavement markers evaluated by NTPEP.

Use raised pavement markers of the prismatic reflector type, or better as approved. The markers shall be constructed either of an injection molded plastic body and base or consist of a plastic shell filled with a mixture of inert thermosetting compound and filler material. Either construction type shall contain one or more integrated prismatic reflective lenses to provide the required color designation.

The minimum reflective area of the lens face is 2.0 sq.in.

The color of the reflective pavement marker housing shall match the pavement marking color, which it supplements.

All raised pavement marker reflective lenses shall be in close conformance with the Federal Standard No. 595 colors as listed below when viewed at night.

Crystal: Color No. 17886 (White)

Yellow: Color No. 13538

Red: Color No. 11302

**(B) Adhesives**

(1) Epoxy

The epoxy shall meet Section 1081.

The 2 types of epoxy adhesive which may be used are Type 6A, Standard Setting, and Type 6C, Rapid Setting. Use Type 6A when the pavement temperature is above 60°F. Use Type 6C when the pavement temperature is between 50°F and 60°F or when a fast set is desirable. Epoxy adhesive Type 6C, Cold Set, may be used to attach temporary pavement markers to the pavement surface when the pavement temperature is between 32°F and 50°F.

(2) Hot Bitumen

The hot bitumen shall meet Article 1081-3.

(3) Pressure Sensitive

As supplied by the manufacturer.

**(C) Material Certification**

Furnish a Type 2 material certification in accordance with Article 106-3 for all raised pavement markers before use.

**1086-2 PERMANENT RAISED PAVEMENT MARKERS**

**(A) General**

Use raised pavement markers evaluated by NTPEP. The markers shall be constructed either of an injection molded plastic body and base or consist of a plastic shell filled with a mixture of inert thermosetting compound and filler material. Either construction type shall contain one or more integrated prismatic reflective lenses to provide the required color designation. Raised pavement markers (permanent) shall be of the glass or plastic face lens type and meet Subarticle 1086-1(A). Plastic lenses shall have an abrasion resistant coating.

## 1 (1) Potted Markers

2 Potted marker shells shall be made of molded methyl methacrylate conforming to  
 3 Federal Specification L P 380C, Type I, Class 3. Filling material shall be an inert  
 4 thermosetting compound selected for strength, resilience, and adhesion adequate to  
 5 meet physical requirements of the *Standard Specifications*. Sand or other inert  
 6 granulars shall be embedded in the surface of the inert thermosetting compound and  
 7 filler material before its curing to provide a surface, which will readily bond to the  
 8 adhesive.

## 9 (2) Injection-molded Markers

10 Injection-molded markers shall consist of polymer materials selected for strength and  
 11 resilience adequate to meet the physical requirements of the *Standard Specifications*.  
 12 The bottom surface of the marker shall contain grooves or nonsmooth structure  
 13 designed to increase bonding with the adhesive.

14 **(B) Optical Requirements**

15 All optical performance for permanent raised pavement markers shall conform to  
 16 ASTM D4280.

17 **(C) Physical Properties**

18 All physical properties for permanent raised pavement markers shall conform to  
 19 ASTM D4280.

20 **(D) Hot Bitumen Adhesives**

21 Use hot bitumen adhesive for mounting the pavement markers to asphalt concrete  
 22 roadways. The hot bitumen adhesive shall meet the requirements of Article 1081-3.  
 23 Other adhesives such as epoxy or cold bituminous adhesive pads are not acceptable on  
 24 asphalt concrete roadways for permanent applications.

25 **(E) Epoxy Adhesives**

26 Use epoxy adhesive for mounting the pavement markers to concrete roadways. The  
 27 epoxy adhesive shall comply with Section 1081. Other adhesives such as hot and cold  
 28 bituminous or adhesive pads are not acceptable on concrete roadways for permanent  
 29 applications.

30 **(F) Material Certification**

31 Furnish a Type 2 material certification in accordance with Article 106-3 for all raised  
 32 pavement markers before use.

33 **1086-3 SNOWPLOWABLE PAVEMENT MARKERS**34 **(A) General**

35 Use snowplowable pavement markers evaluated by NTPEP. The snowplowable  
 36 pavement marker shall consist of a cast iron housing with one or more glass or plastic  
 37 face lens type reflective lenses to provide the required color designation. Shape the  
 38 casting to deflect a snowplow blade upward in both directions without being damaged.  
 39 Incorporate into the casting 2 parallel keels and a connecting web designed to fit into  
 40 slots cut into the road surface. Plastic lens faces shall use an abrasion resistant coating.

41 Use recycled snowplowable pavement markers that meet all the requirements of  
 42 new snowplowable pavement markers except Subarticle 1086-3(B)(1). Recycled  
 43 snowplowable pavement markers with minimal variation in dimensions are acceptable  
 44 only when the reflector fits in the casting of the recycled snowplowable pavement marker  
 45 as originally designed.

## Section 1086

### 1 (B) Castings

#### 2 (1) Dimensions

3 The dimension, slope and minimum area of reflecting surface shall conform to  
4 dimensions as shown in the plans. The minimum area of each reflecting surface  
5 shall be 1.44 sq.in.

#### 6 (2) Materials

7 Use nodular iron in accordance with ASTM A536.

#### 8 (3) Surface

9 The surface of the keel and web shall be free of scale, dirt, rust, oil, grease or any  
10 other contaminant which might reduce its bond to the epoxy adhesive.

#### 11 (4) Identification

12 Mark the casting with the manufacturer's name and model number of marker.

### 13 (C) Reflectors

#### 14 (1) General

15 Laminate the reflector to an elastomeric pad and attach with adhesive to the casting.  
16 The thickness of the elastomeric pad shall be 0.04".

#### 17 (2) Reflector Type

- 18 (a) One-direction, one color (crystal)
- 19 (b) Bidirectional, one color (yellow and yellow)
- 20 (c) Bidirectional, two colors (red and crystal)
- 21 (d) Bidirectional, two colors (red and yellow)

22 All pavement marker reflective lenses shall be in close conformance with the Federal  
23 Standard No. 595 colors as listed below when viewed during night situations.

Crystal: Color No. 17886 (White)

Yellow: Color No. 13538

Red: Color No. 11302

#### 24 (3) Reflector Optical Requirements

##### 25 (a) Definitions

26 Define "horizontal entrance angle" as the angle in the horizontal plane between  
27 the direction of incident light and the normal to the leading edge of the marker.

28 Define "observation angle" as the angle, at the reflector, between observer's line  
29 of sight and the direction of the light incident on the reflector.

30 Define "specific intensity (S.I.)" as candlepower of the returned light at the  
31 chosen observation and entrance angles for each footcandle of illumination at  
32 the reflector.

$$\mathbf{S.I.} = \mathbf{RL} \times (\mathbf{D} \times \mathbf{D}) \times \mathbf{IL}$$

Where:

**S.I.** = Specific Intensity

**RL** = Reflected Light

**IL** = Incident Light

**D** = Test Distance

**(b) Optical Performance**

Test the reflector for specific intensity as described below:

Form a 1" diameter flat pad using #3 coarse steel wool per Federal Specification FF-W-1825. Place the steel wool pad on the reflector lens. Apply a load of 50 lb and rub the entire lens surface 100 times. Do not abrade the red lens of the Type 3 and Type 4 bi-directional units.

Locate the reflector to be tested with the center of the reflecting face at a distance of 5 ft from a uniformly bright light source having an effective diameter of 0.2".

The photocell must be an angular ring 0.37" I.D. x 0.47" O.D. Shield it to eliminate stray light. The distance from light source center to the center of the photoactive area shall be 0.2". If a test distance of other than 5 ft is used, modify the source and receiver in the same proportion as the test distance.

After abrading the lens surface using the above steel wool abrasion procedure, the specific intensity of each crystal reflecting surface at 0.2 degrees observation angle must not be less than the following when the incident light is parallel to the base of the reflector.

<b>TABLE 1086-1 MINIMUM SPECIFIC INTENSITY (candle/footcandle/unit marker)</b>		
<b>Color</b>	<b>Horizontal Entrance Angle</b>	
	<b>0 Degrees</b>	<b>20 Degrees</b>
Crystal	3.00	1.20
Yellow	1.80	0.72
Red	0.75	0.30

**(D) Properties**

All optical and physical properties for snowplowable pavement markers shall conform to ASTM D4383.

**(E) Epoxy Adhesive**

The epoxy adhesive shall meet the requirements of Section 1081. Mix the epoxy adhesive rapidly by a 2 component type automatic metering, mixing and extrusion apparatus.

**(F) Material Certification**

Furnish a Type 2 material certification in accordance with Article 106-3 for all raised snowplowable markers before use.

## **SECTION 1087 PAVEMENT MARKINGS**

**1087-1 GENERAL**

Yellow and white pavement markings shall be retroreflective. Black pavement markings shall be matte, non-retroreflective.

The material manufacturer has the option of formulating the pavement marking material according to his own specifications; however, the manufacturer shall meet all the minimum requirements specified herein.

All pavement marking materials, pigments, beads and resins shall be free from all skins, dirt and foreign objects.